

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced Subsidiary/Advanced



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Addysg Gyffredinol
Uwch Gyfrannol/Uwch

311/01

BIOLOGY

MODULE BI1

A.M. WEDNESDAY, 10 January 2007

(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	
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INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

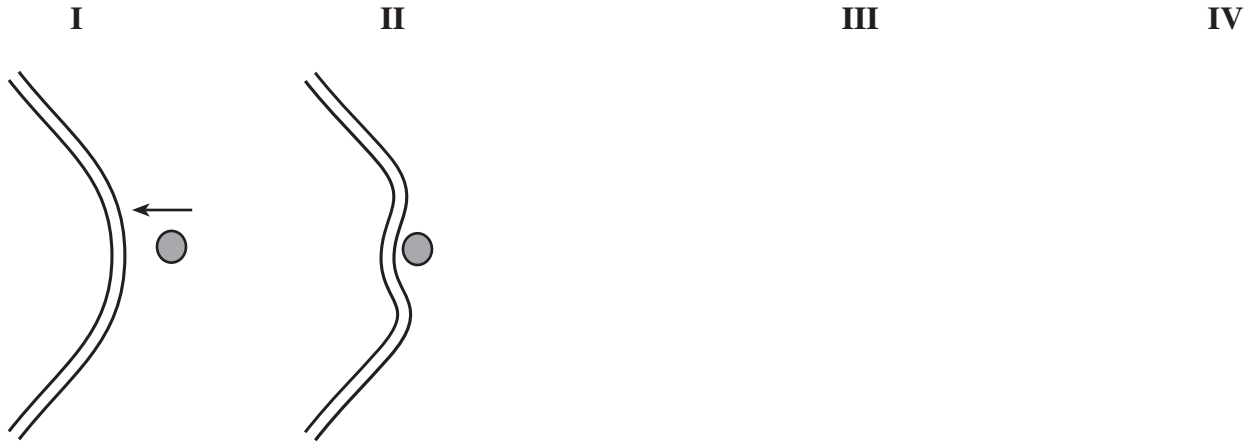
The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. (a) Diagrams **I** and **II** below show the beginning of the process by which a particle is taken into a cell. In the spaces provided, draw and **label** two diagrams (**III** and **IV**) to show the completion of the process. [3]



- (b) What effect does this process have on the surface area of the cell membrane? [1]

(c) Name:

- (i) the process, [1]

.....

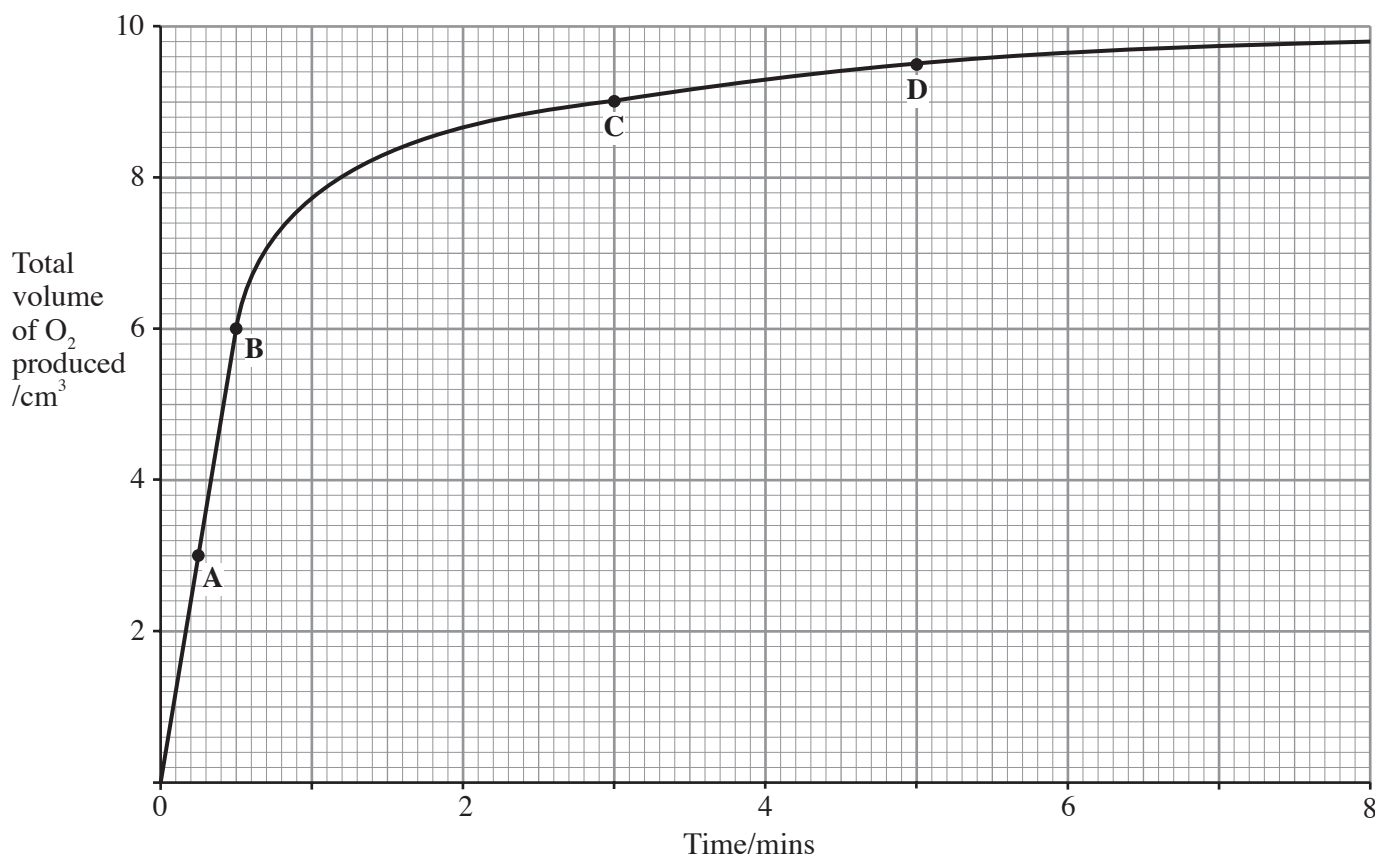
- (ii) the movement of materials in the reverse direction across the membrane. [1]

.....

(Total 6 marks)

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2. The enzyme catalase is found in raw potato. It breaks down hydrogen peroxide, releasing oxygen. Minced potato was placed in a buffer solution in a flask. 5cm³ of 3% hydrogen peroxide solution was run into the flask and the oxygen given off was collected in a graduated flask. The volume of oxygen present was noted every 30 seconds and the results are shown in the graph.



- (a) (i) Calculate the mean value of the reaction rate (in cm³ O₂ min⁻¹) for the period from **A** to **B**. [1]

.....

- (ii) How much greater is this value than that for **C** to **D**? [1]

.....

- (b) What is the limiting factor on the rate of reaction

- (i) between **A** and **B**, [1]

.....

- (ii) between **C** and **D**? [1]

.....

(c) (i) Draw a line on the graph to show the effect of adding a small quantity of a non-competitive inhibitor at the start of a similar experiment. [1]

(ii) Explain the position you have chosen for your line. [1]

.....
.....

(iii) Explain why the inhibitor is referred to as non-competitive. [2]

.....
.....

(d) Suggest why the potato was minced. [1]

.....

(e) Explain why the absence of a buffer solution would make it difficult to obtain reproducible results. [2]

.....
.....

(f) The flask was clamped in a constant temperature water bath. Explain why. [1]

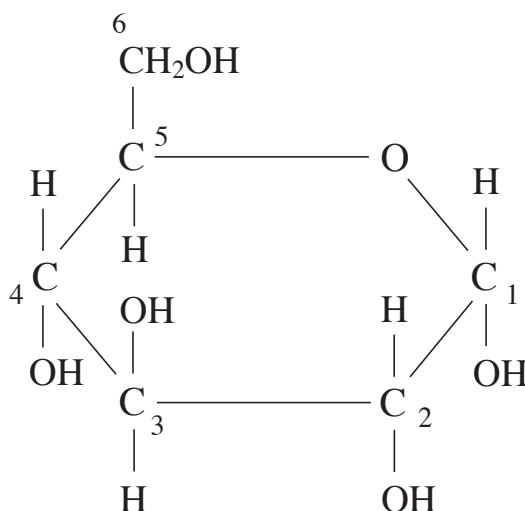
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(g) Suggest what might happen to the enzyme if the temperature was allowed to rise above 60°C. [1]

.....

(Total 13 marks)

3. The diagram below shows a molecule of α -glucose.



- (a) (i) What name is given to this type of monosaccharide? [1]
.....
- (ii) Name the disaccharide formed when two molecules of α -glucose combine. [1]
.....
- (iii) What else is formed in this reaction? [1]
.....
- (iv) Which carbon atoms (give numbers from the diagram) form the glycosidic bond? [1]
.....
- (b) (i) Explain how the diagram for β -glucose would differ from the above diagram. [1]
.....
- (ii) Why are α - and β -glucose referred to as isomers? [1]
.....
.....
- (c) Which of the two isomers form the polysaccharide cellulose in plants? [1]
.....
- (d) Apart from a few insects and some snails, the great majority of animals have failed to evolve an enzyme that will digest cellulose. Explain why cellulose is so much less reactive than other polysaccharides. [1]
.....
.....

(e) Explain **one** advantage that the cellulose structure confers on the plant.

[1]

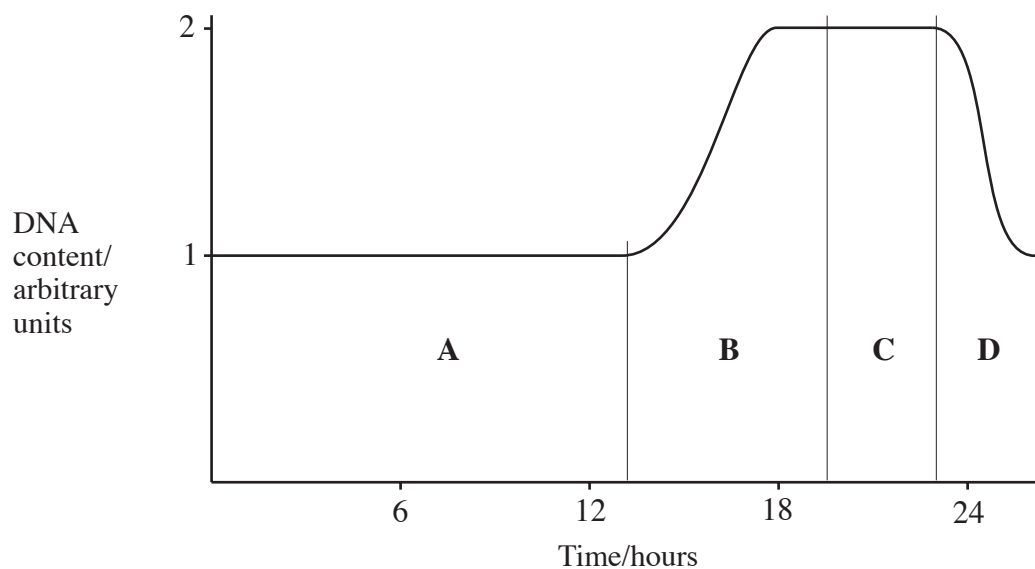
(Total 9 marks)

4. Complete the table below by ticking (✓) the boxes to show which of the organelles are described by the statements listed. [7]

	<i>Smooth endoplasmic reticulum</i>	<i>Mitochondria</i>	<i>Golgi body</i>	<i>Rough endoplasmic reticulum</i>
Surrounded by a double membrane				
Produces glycoprotein				
Buds off lysosomes				
Manufactures hormones and enzymes				
Most abundant at sites of active transport				
Abundant in cells secreting lipids				
Closely associated with ribosomes				

(Total 7 marks)

5. Most cells go through a cyclic process of growth and division. The diagram below shows the changes in DNA content during one cell cycle in most animals and plants.



- (a) Use the letters from the diagram to indicate the period(s) when: [3]

(i) chromosomes are being duplicated;

.....

(ii) cell division is taking place;

.....

(iii) interphase occurs.

.....

- (b) List **three** processes which take place during interphase. [3]

1.

2.

3.

- (c) Explain the change in DNA content in **D** in the diagram. [2]

.....
.....

- (d) (i) Can you tell whether the diagram shows meiosis **I** or mitosis? [2]
(Draw a circle around your choice).

Yes

No

- (ii) Explain your choice.

.....

.....

.....

- (e) Give **two** ways in which the chromosomes at the end of meiosis **I** would differ from those at the end of mitosis. [2]

1.

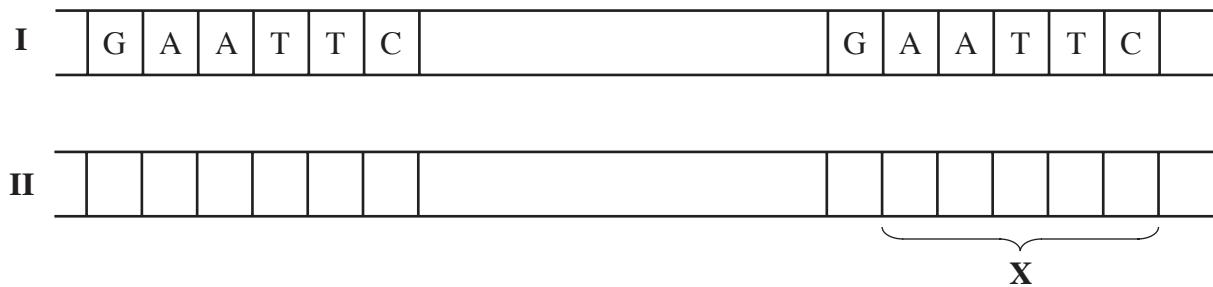
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2.

.....

(Total 12 marks)

6. The bacterium *Escherichia coli* produces an enzyme called EcoRI. This enzyme causes a reaction that results in a breakage in a strand of DNA. The break always occurs where guanine is adjacent to adenine in a specific sequence of bases on the DNA strand. The diagram below shows a small section of the double stranded DNA from a human. Part of the base sequence is labelled on strand I.



- (a) Write the base sequence in the boxes on strand II. [1]
- (b) Draw arrows on the diagram to show the points where the enzyme would break strands I and II. [1]
- (c) (i) In the space below, draw the separated piece of double stranded DNA after the enzyme reaction had taken place. [1]

- (ii) What is the most obvious feature of the sequence of bases in your drawing? [1]

.....

- (d) After the reaction, what name is given to region X? [1]

.....

- (e) Name the group of enzymes to which EcoRI belongs. [1]

.....

(f) Genetic engineering makes use of the above technique to open the circular DNA in a bacterium. If a human gene, which codes for a valuable protein, occurs between the base sequences in the diagram, the fragment you have drawn can be joined into the bacterial structure. This enables the bacterium to synthesise the human protein.

(i) Name this bacterial structure. [1]

.....

(ii) Name the enzyme used to fix the fragment into the bacterial structure. [1]

.....

(g) The alternative technique is to collect human cells which produce this protein and extract the mRNA which codes for it from the cytoplasm. In the presence of free nucleotides and an enzyme the corresponding length of single stranded DNA is formed.

(i) Name this type of enzyme. [1]

.....

(ii) Another enzyme is used to turn this single strand into a double strand. Name this enzyme. [1]

.....

(iii) Suggest **one** advantage of this technique over the method shown in the diagram. [1]

.....

.....

(h) Name a major international research project which was completed in the last few years that is likely to be helpful to genetic engineers in the future. Explain how it will help. [2]

.....

.....

.....

(Total 13 marks)

Any diagrams included in your answer must be fully annotated.

Describe the various ways in which small molecules enter the cell. [6]

Or (b) Give an account of the role of RNA in protein synthesis. [10]

[illegible]

(311-01)

(Total 10 marks)